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October 15, 1998

FEDERAL EXPRESS

Mr. Daniel Rodriguez Corchado
USEPA
Caribbean Environmental Protection Div.
Centro Europa Building, Suite 417
1492 Ponce de Leon Avenue
San Juan, PR 00907-4127

Re: Proteco

Dear Mr. Corchado:

Enclosed please find Proteco's supplemental submission to EPA relating to the issue of whether any post-closure groundwater monitoring will be required in connection with Proteco's former hazardous waste units. Specifically, this supplemental submission addresses the following issues which Proteco and EPA identified at their September 14, 1998 meeting: 1) whether ASTM standard D 5717-95, "Standard Guide for Design of Ground-Water Monitoring Systems in Karst and Fractured-Rock Aquifers," is applicable and relevant to the Proteco Landfill site; 2) whether there is any relevant flow path between the Juana Diaz Formation and the underlying Reef Limestone; and 3) whether the Reef Limestone can be considered as an aquifer "yielding economically significant quantities of water to wells and springs."

As set forth in the annexed submission, ASTM standard D 5717-95 does not apply to the Proteco Landfill site, there is no relevant flow path between the Juana Diaz Formation and the Reef Limestone, and the Reef Limestone is not used as a source of drinking water anywhere near the Proteco Landfill site or in the Tallaboa River Valley west of the site.

As discussed with EPA, Proteco will sample deep well MW-51D screened in the Reef Limestone and located west-northwest of the destroyed well MW-50D. This sampling should help resolve the issue concerning whether chlorinated solvents are present in the Reef Limestone

and whether they have migrated downgradient from MW-50D, which showed elevated concentrations of 1,1,DCE; 1,1,DCA; 1,1,trans DCE; TCE; and PCE in December 1987.

Proteco expects to have the results of the groundwater sampling later next month. As discussed at the September 14 meeting, Proteco would like to schedule a telephone conference with EPA to discuss this supplemental submission, and the issue concerning whether Proteco's post-closure permit application needs to include any post-closure groundwater monitoring plan. For the reasons set forth in both Proteco's initial and supplemental submissions, Proteco does not anticipate that it is necessary for Proteco to include a post-closure groundwater monitoring plan in its post-closure permit application.

Sincerely,

Sy Gruza

SG:mll
Enclosure

cc: Clifford Ng
Amy Chester, Esq.
Neven Kresic
Dr. Jorge Fernandez

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RELEVANCE OF ASTM STANDARD D 5717-95[1] TO HYDROGEOLOGIC CONDITIONS
AT PROTECO LANDFILL FACILITY, PENUELAS, PUERTO RICO

Juana-Diaz Formation

Proteco Landfill facility is geologically located within the clayey, clastic rocks of Juana-Diaz Formation which completely surround and underly all former and active units at the landfill. Extensive site-specific hydrogeologic investigations conducted over the period of more than fifteen years by various consultants, as well as geologic, hydrogeologic and water resources investigations of Tallaboa Valley, Peñuelas and Ponce areas conducted by government agencies such as U.S. Geological Survey, Puerto Rico Planning Board, Commonwealth of Puerto Rico, Department of Natural Resources, undoubtedly concluded that the Juana-Diaz Formation is not an aquifer. ASTM standard D 5717-95[1], which addresses karst and fractured-rock aquifers, is therefore not applicable to clayey rocks of the Juana-Diaz Formation.

Given below is definition of term *aquifer* (Dictionary of Geological Terms, Third Edition, 1984. Prepared by the American Geological Institute, Robert L. Bates and Julia A. Jackson, Editors, Anchor Press/Doubleday, Garden City, New York, 571 p.):

aquifer (aq'-ui-fer) A body of rock that is sufficiently permeable to conduct ground water and to yield economically significant quantities of water to wells and springs.

Listed further are some of many reasons (see enclosed list of references) why the Juana-Diaz Formation underlying the Proteco Landfill facility is not "sufficiently permeable to conduct ground water" and does not "yield economically significant quantities of water to wells and springs":

- The Juana-Diaz Formation present at the Proteco Landfill facility consists of clayey sediments, e.g., "layers of siltstone and mudstone which are unsaturated to a depth generally between 50 and 150 feet. This unsaturated zone has very low permeability (on the order of

[1] ASTM D 5717-95 "Standard Guide for Design of Ground-Water Monitoring Systems in Karst and Fractured-Rock Aquifers", American Society for Testing and Materials, 1995; 17 pages.

10^{-7} cm/sec or less." (REFERENCES III, A.T. Kearney, Inc. and Lee Wan and Associates, Inc., 1987).

- Within short horizontal distances at the site "Water levels in the Juana-Diaz Formation range from 86 to almost 200 above sea level, suggesting that it is not part of the regional system." (REFERENCES III , A.T. Kearney, Inc. and Lee Wan and Associates, Inc., 1987). Significant differences in water levels registered in close monitoring wells, and presence of completely dry clayey deposists below these "wet" horizons, indicate absence of a continuous saturated zone and presence of aquiclude (impermeable) media both vertically and horizontally.

- Most of the monitoring wells drilled in the Juana-Diaz Formation at the site were initially dry or had negligible yields, and "water was found standing in several of them a few days later. This water seems to have collected in the exposed horizon of the drill hole through exudation of the trapped or connate water with movement initiated by the pressure differences created through the exposure of the horizon by the drill-hole. Moisture content of soil samples from this geologic horizon demonstrates that moisture is spotty and not uniform." (REFERENCES I, Servicios Carbareon, Inc., 1984). These foundings show that groundwater in the Juana-Diaz Formation does not constitute an aquifer, i.e., there is no a continuous saturated zone with groundwater freely flowing through interconnected network of fractures that could "yield economically significant quantities of water to wells".

- Age dating of water within the Juana-Diaz Formation (done by evaluation of isotopes of common elements such as oxygen and carbon) show that "groundwater residence time in the formation below the site is on the order of thousands of years, illustrating that this is not a fast flushing aquifer and that surface water at the site is not a primary source of formation water. Therefore, wells could not yield enough water for potable purposes and groundwater is not a likely release pathway." (REFERENCES III, A.T. Kearney, Inc. and Lee Wan and Associates, Inc., 1987).

- "No known drinking water wells exist near the site. In the vicinity of the site, several public wells have been drilled, but were abandoned due to high mineral content." (REFERENCES III, A.T. Kearney, Inc. and Lee Wan and Associates, Inc., 1987).

- Similar experiences have been obtained from wells tapping the Juana-Diaz Formation in other localities: "A well near Palomos-Yauco, about 15 miles west of Carbareon's site, penetrated 75 feet of clastic rock of the Juana Diaz Formation, but yielded only about 5 gallons per minute. This water was so highly mineralized that it could not be used for human consumption." (Servicios Carbareon, Inc., 1984; see also REFERENCES I - Crooks, W.J., and others, 1968). "Similarly, all the wells drilled in the Tallaboa region and elsewhere tapping water occurences in the Juana Diaz Formation have produced small unreliable mineralized yields." (Servicios Carbareon, Inc., 1984; see also REFERENCES I - Crooks, W.J., and others, 1968; Grossman, I.G., 1961; Grossman, I.G., 1962; Grossman, I.G. and others, 1972).

- There are no known permanent or significant springs within the Juana-Diaz Formation near the site or in the Tallaboa River Valley west of the site.

- Juana-Diaz formation has highly mineralized water and "being of marine origin and of low permeability, retains some of the original salinity at the time of deposition so that its groundwater is invariably salty." (REFERENCES I, Giusti, E.V., 1968).

- Chloride concentrations in natural water found in clayey clastic rocks of the Juana-Diaz Formation range from 18500 to 25700 mg/L, sulfate concentrations range from 1780 to 4010 mg/L, total dissolved solids range from 31100 to 45300 mg/L, and sodium concentrations range from 4160 to 8270 mg/L (OHM Remediation Services Corp., 1994). For comparison, average concentrations of these species in sea water are 19000 mg/L for chloride, 2650 mg/L for sulfate, and 10500 mg/L for sodium (Driscoll, 1986). According to Drinking Water Regulations and Health Advisories by U.S. Environmental Protection Agency (1996), groundwater with concentration of chlorides in excess of 250 mg/L, sulfates in excess of 250 mg/L, and total dissolved solids in excess of 500 mg/L is not considered usable. Therefore, water present in the Juana-Diaz Formation surrounding and underlying the site is not useable for domestic or irrigation purposes.

CONCLUSION: Thick sequence (>100 feet) of clayey sediments of the Juana-Diaz Formation surrounding and underlying the Proteco Landfill facility acts as a low-permeable medium in which groundwater stagnates in discontinuous pockets and/or moves very slowly toward the southern portion of the site. This groundwater is highly mineralized, old (not exposed to infiltration of fresh water from the land surface), and it is not suitable for domestic use or irrigation purposes both in terms of quantity and quality. For all the above listed reasons ASTM standard D 5717-95 is not applicable to the Juana-Diaz Formation.

Limestone ("Reef Limestone")

It is our understanding that EPA's main concern regarding possible migration of contaminants off site is related to the existence of "Reef Limestone" (Limestone) below clayey sediments of the Juana-Diaz Formation (see enclosed figures). This limestone is found in deep boreholes at depths ranging from 160 to 220 feet below ground surface with water levels in monitoring wells ranging from 150 to 200 feet below land surface (REFERENCES II; Hart Engineers, Inc., 1988; OHM Remediation Services Corp., 1994).

Listed below is some of the evidence (list of references is enclosed) showing that there is no flow path between portions of the Juana-Diaz Formation containing water and the underlying Reef Limestone. Also included is the evidence why Reef Limestone cannot be considered as an aquifer "yielding economically significant quantities of water to wells and springs".

- Water found in Reef Limestone is much less mineralized than the saline water from the Juana-Diaz Formation. However, this water is still not suitable for human consumption since it has concentrations of chlorides, sulfates, total dissolved solids and sodium in excess of usable groundwater standards.

- An order of magnitude change (decrease) in specific conductivity, total dissolved solids, chloride, sulfate and sodium is evidence that Reef Limestone and the Juana-Diaz Formation are not hydraulically interconnected, i.e., there is no flow of water from the Juana-Diaz Formation into underlying Reef Limestone.

- Except for deep monitoring well MW-50D, none of the wells screened in the Reef Limestone zone detected volatile aromatic compounds or other contaminants. However, the presence of volatiles in MW-50D "may be attributed to cross-contamination during well construction" (OHM Remediation Services Corp., 1994).

- Hydraulic gradient in the Reef Limestone at the site is both toward south (down dip) and west-northwest (along strike) (weekly data September 1986 through February 1987; OHM Remediation Services Corp., 1994). There are no known discharge points (e.g., water wells or springs) in Reef Limestone off site. This limestone unit dips in the southerly direction under younger clayey sediments of the Juana-Diaz Formation and is several thousand feet below land surface along the Gulf coast.

- There are no wells tapping Reef Limestone along the coast and their installation would be economically unjustified because of cost of drilling and unsuitability of groundwater for human consumption (due to slow movement/stagnation of groundwater in the area deep below sea level its chemical composition would be even more unfavorable than in the upland areas).

- There are no known springs or wells tapping Reef Limestone in the Tallaboa River Valley, i.e. west-northwest of the site in the direction of strike (see enclosed figures):

  "the Ponce Limestone is the only productive bedrock in the area" (REFERENCES I, Grossman and others, 1972). Reef Limestone is not reported in wells/boreholes in the Tallaboa River valley. If present, it would be at greater depths, separated from the alluvial deposits and Ponce Limestone by clayey sediments of the Juana-Diaz Formation.

CONCLUSION: Reef Limestone present at the site at the base of the Juana-Diaz Formation is not hydraulically connected with the above clayey sediments as suggested by the strong hydrogeochemical evidence and hydraulic characteristics of the Juana-Diaz Formation. In addition, Reef Limestone cannot be considered as an aquifer which would "yield economically significant quantities of water to wells and springs" because of its stratigraphic position and water quality. This is supported by the fact that Reef Limestonre is not used as a source of drinking water anywhere near the site or in the Tallaboa River valley west of the site. For all the above reasons ASTM standard D 5717-95 is not applicable to the Reef Limestone at the Proteco Landfill facility.

As suggested by EPA, Proteco agrees to sample deep well MW-51D screened in Reef Limestone and located west-northwest of the destroyed well MW-50D. This sampling would resolve the issue of the potential presence of chlorinated solvents in Reef Limestone and their migration downgradient of MW-50D which showed elevated concentrations of 1,1,DCE; 1,1,DCA; 1,1,trans DCE; TCE; and PCE in December 1987.

Listed below are references (REFERENCES I) cited in the following document:

Servicios Carbareon, Inc., "RCRA Part B Permit Application, Appendices -- Volume II (Revised 10/31/84), Appendix E-1", Ponce, Puerto Rico, 1984 (submitted to Region II, U.S. Environmental Protection Agency).

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Crooks, W.J., and others, Water Resources of the Guayanilla-Yauco Area, Puerto Rico: Water Resources Bulletin 5, U.S. Geological Survey, 1968.

Diaz, J.R., Coastal Salinity Reconnaissance and Monitoring System -South Coast of Puerto Rico, Open-File Report 74-1: U.S. Geological Survey, 1974.

Factors and Problems of Water Use, Water Management and Protection of Water in Puerto Rico: U.S. Geological Survey, Summary.

Fields, F.K., Floods in the Guayanilla-Yauco Area, Puerto Rico Atlas H.A.-414: U.S. Geological Survey 1971.

Giusti, E.V., 1968, Water Resources of the Juana Diaz Area, Puerto Rico, Water Resources Bulletin 8: U.S. Geological Survey, 43 p.

Grossman, I.G., 1961, Groundwater Conditions in the Lower Tallaboa Valley, Puerto Rico: U.S. Geological Survey Professional Paper 424-C, p. 202-203.

Grossman, I.G., 1962, Stratigraphy and Hydrology of the Juana Diaz Formation in the Yauco Area, Puerto Rico: U.S. Geological Survey Professional Paper 450-D, 62-63.

Grossman, I.G. and others, 1972, Water Resources of the Tallaboa Valley, Puerto Rico, Water Resources Bulletin 7: U.S. Geological Survey.

Haire, W.J., Floods in the Fajardo-Luquillo Area, Northeastern Puerto Rico, Atlas H.A.-545: U.S. Geological Survey, 1975.

Johnson, K.G., Floods of September 16, 1975 in Tallaboa Valley, Puerto Rico; Report 80-1283: U.S. Geological Survey, 1981.

Krushensky, R.D. and Monroe, W.H.: Geologic Map of the Penuelas and Punta Cuchara Quadrangles, P.R., Map I-1042: U.S. Geological Survey, 1978.

Krushensky, R.D. and Monroe, W.H., Geologic Map of the Ponce Quadrangle, P.R., Map I-863: U.S. Geological Survey, 1975.

McClymonds, N.E., Water Resources of the Guanica Area, Puerto Rico; Water Resources Bulletin 6 & 14: U.S. Geological Survey, 1967, and 1972 respectively.

Peck, D.L., Water Resources Data for Puerto Rico: U.S. Geological Survey Water Data Report, 1979-80.

Puerto Rico Island-Wide Water Supply, Volume I, Main Report, Plan Formulation, September 1980.

R.A. Domenech & Associates, Hato Rey, Puerto Rico and Black & Veatch Consulting Engineers, Kansas City, Missouri, 1970; Water Resources of Puerto Rico, Phase II Ground Water Appraisal, Prepared for Puerto Rico Planning Board, June 1970, San Juan, Puerto Rico.

Torres, Arturo and Gomez, Fernando; Geohydrologic Descriptions of Selected Solid-Waste Disposal Sites in Puerto Rico; Open-File Report 81-490: U.S. Geological Survey, 1982.

The 1973 Water Resources Assessment for Puerto Rico; Commonwealth of Puerto Rico, Department of Natural Resources, 1974.

Zapp, A.D., Bergquist, H.R., and Thomas, C.R., Tertiary Geology of the Coastal Plains of Puerto Rico, 1968.

Listed below are references (REFERENCES II) extensively reviewed and cited in the following document:

OHM Remediation Services Corp; "Proteccion Tecnica Ecologica (Proteco) Inc., Hydrogeologic Data Interpretation"; Prepared for Proteco, Santurce, Puerto Rico, 1992.

REFERENCES II

Fred C. Hart Associates, Inc., August 30, 1985
Geotechnical Evaluation for Proteccion Tecnica Ecologica, Inc. (Proteco)

Fred C. Hart Associates, Inc., July 1986
Hydro Phase III - Work Plan
Proteccion Tecnica Ecologica, Inc. (Proteco)

Fred C. Hart Associates, Inc., September 1986
Phase IA Hydrogeologic Investigation
Proteccion Tecnica Ecologica, Inc. (Proteco)
Ponce, Puerto Rico Volume 2; Appendix A

Fred C. Hart Associates, Inc., September 1986
Phase IA Hydrogeologic Investigation
Proteccion Tecnic Ecologica, Inc. (Proteco)
Ponce, Puerto Rico Volume 3; Appendices B-F

Fred C. Hart Associates, Inc., February 1987
Phase IA Hydrogeologic Investigation
Protecccion Tecnica Ecologica, Inc. (Proteco)
Ponce, Puerto Rico Volume I

Hart Engineers, Inc., September 23, 1988
Unit 9 Investigation Work Plan
Proteccion Tecnica kEcologica, Inc. (Proteco), Ponce, Puerto Rico

Jaca, Sierra & Rivera, Soil Consulting Engineers, September 28, 1979
Memorandum; Ground Water Level Determination; Industrial
Wastes Disposal Yard; Valdivieso Farm; Tallaboa, Puerto Rico

Jaca, Sierra & Rivera, Geotechnical Engineers and Testing Laboratories, September 28, 1979
Memorandum #5; Additional Ground Water Level; Determinations
and Other Field Test Results, Industrial Wastes Disposal Yard; Valdivieso Farm;
Tallaboa, Puerto Rico

Jaca, Sierra & Rivera, Geotechnical Engineers and Testing Laboratories, June 1980
Memorandum; Additional Ground Water Level; Determinations and
Other Field Test Results, Industrial Wastes Disposal Yard; Valdivieso Farm;
Tallaboa, Puerto Rico

Mario Soriano Ressy; Geological Engineer, August 1983
Hydrogeologic Conditions at Carbarcon Waste Disposal Site

Mario Soriano, P.E.; June 1985
Hydrologic Study of Proposed Project for "Servicios Carbarcon"
Prepared by: Jordache Construction, Inc.; Abuid Reyes, P.S.

OHM Remediation Services Corp
December 1987 Sampling and Analysis of Reef Limestone Wells and Well 36SW-86

Proteccion Tecnica Ecologica, Inc. (Proteco), June 30, 1986
Part B Permit Application; PRD 091018622
Penuelas, Puerto Rico
Volume 4; Revision 2; Signifies changes made in Revision 1,
Submitted March 17, 1986; Revision 2: June 30, 1986

Proteccion Tecnica Ecologica, Inc. (Proteco), May 27, 1987
Proteco Facility Part B Application; Response to Remaining Issues and Special Permit Conditions; Letter to Mr. Walka;
Dated May 27, 1987; Copies of the following:

A. *Response to Regulatory Questions on Part B Application*
B. *A Draft of Special Permit Conditions*
C. *Part B Application Revision No. 4*
D. *Technical Specifications for the Proposed*
E. *Response Action Outline*
F. *Sketch of Unit 16 Final Grading Plan*
G. *June 5, 1986 Letter from R.M. Walka to Dr. J.J. Fernandez*
H. *Re: Unit 17*
I. *May 15, 1987 Memorandum from J.E. Negron to G. Brown*
Re: Coordination Agreements

Listed below are other references (REFERENCES III) reviewed:

REFERENCES III

A.T. Kearney, Inc., Alexandria, VA and Lee Wan and Associates, Inc., Atlanta, GA; *Final RCRA Facility Assessment Report, Municipal Dump Facility, Ponce, Puerto Rico, EPA I.D. No. PRD 98 0594709*; Prepared for U.S. Environmental Protection Agency, Region II, October 1987.

Driscoll, F.G., 1986, *Groundwater and Wells*. Johnson Filtration Systems Inc., St. Paul, Minnesota, 1089 p.

Geraghty & Miller, Inc.; *An Assessment of Hydrogeologic Conditions and Ground-Water Contamination Potential at the Valdivieso Farm Chemical Disposal Site, Tallaboa, Puerto Rico*; Prepared for Servicios Carbareon, Inc., Santurce, Puerto Rico, 1981.

OHM Remediation Services Corp.; *Hydrologic Investigation, Proteco Landfill Facility, Peñuelas, Puerto Rico*; Prepared for Proteccion Tenica Ecologica, Peñuelas, Puerto Rico, September 1994.

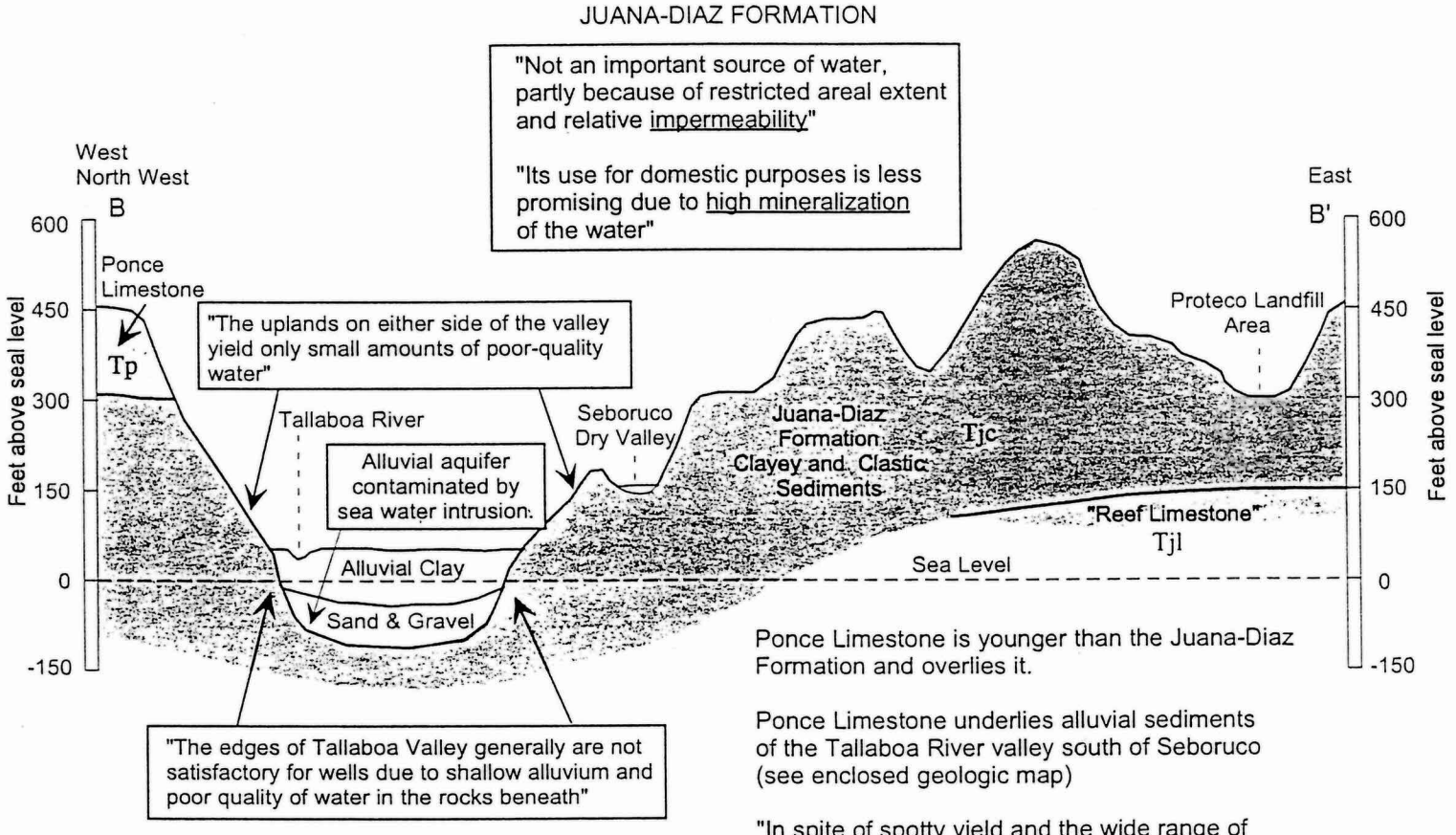
United States Environmental Protection Agency, Hazardous Waste Groundwater Task Force, 198; *EPA-700/8-87-005, Groundwater Monitoring Evaluation, Proteccion Tecnica Ecologica (Proteco), Penuelas, Puerto Rico*; Ton H. Moy, Project Coordinator, U.S. Environmental Protection Agency, Region II..

United States Environmental Protection Agency, Office of Water 4304, 1996; *Drinking Water Regulations and Health Advisories*, EPA 822-B-96-002.

GEOLOGIC CROSS-SECTION BB' ALONG THE STRIKE
PROTECO LANDFILL AREA

Location of the cross-section and the area geology shown on the enclosed
"Geologic Map of the Proteco Landfill Area and its Surroundings"
Source: USGS geologic map of the Penuelas and Punta Cuchara Quadrangles, Puerto Rico, 1978

Note: All text in quotes from "Water Resources of the Tallaboa Valley, Puerto Rico" by Grossman et al., 1972, United States Geological Survey in cooperation with the Commonwealth of Puerto Rico, Water -Resources Bulletin 7, 115 p.

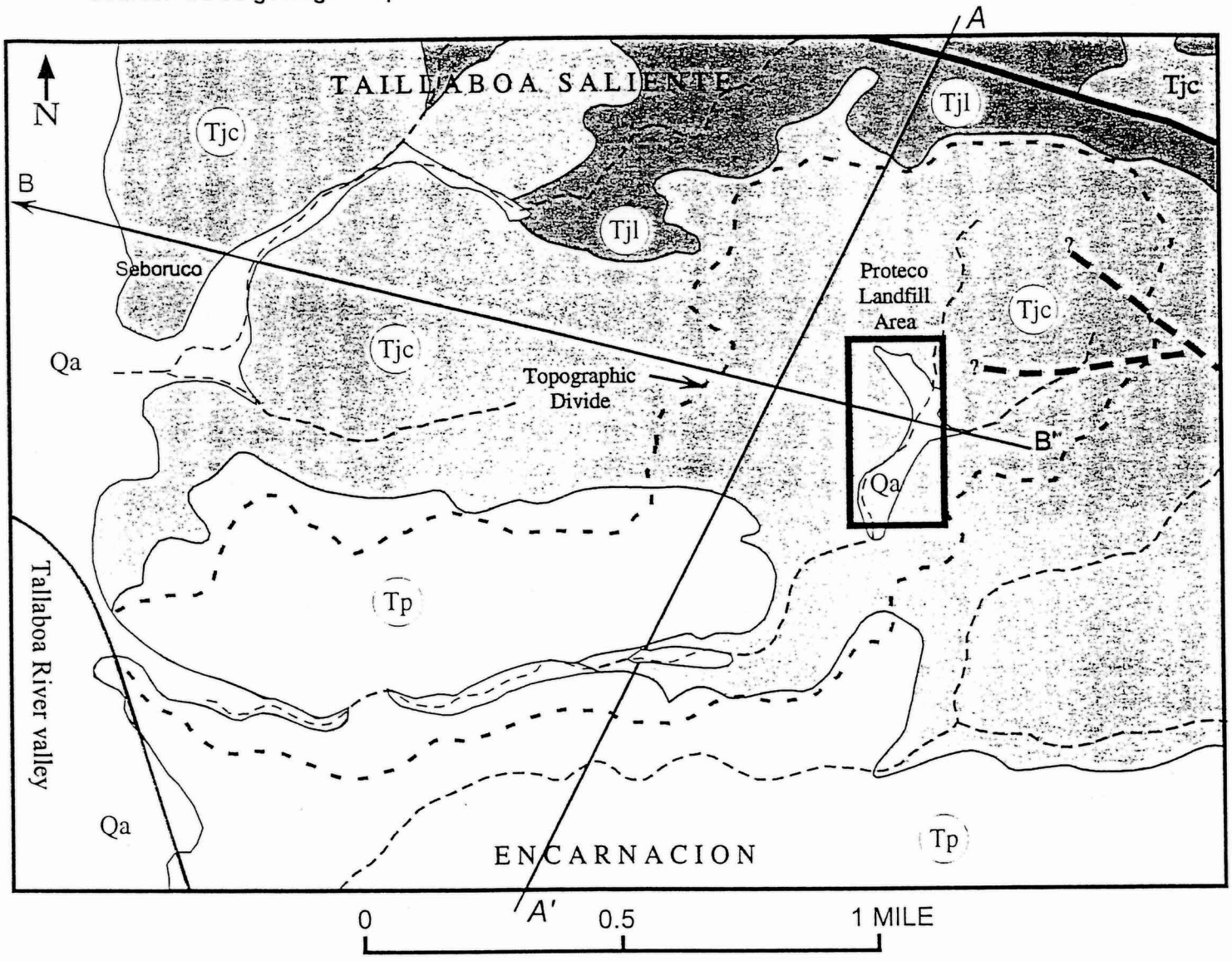


"Reef Limestone" (Limestone) found below Juana-Diaz Formation at the Proteco site is not reported in wells/boreholes completed in the Tallaboa River valley. Elsewhere, when present, this limestone is separated from younger Ponce Limestone with clayey and clastic sediments of the Juana-Diaz Formation.

There is no flow path between "Reef Limestone" (Tjl) and the Tallaboa River Valley or Ponce Limestone which underlies the valley alluvium south of Seboruco.

GEOLOGIC MAP OF THE PROTECO LANDFILL AREA AND ITS SURROUNDINGS

Source: USGS geologic map of the Penuelas and Punta Cuchara Qudrangles, Puerto Rico, 1978



Tp — PONCE LIMESTONE - very pale orange to grayish-orange generally crystalline calcarenite. Overlies disconformably the Juana Diaz Formation.

JUANA-DIAZ FORMATION:

Tjc — Upper unit - crossbeded sand, gravel, carbonaceous clay, calcareous clay, clayey chalk, chalky limestone.

Tjl — White to grayish-orange limestone, mostly crystalline and coralline; contains lenses of cobbles and sandy mudstone as much as 10 m thick.. Separates the upper unit from the base unit consisting of interlensing conglomerate and mudstone.

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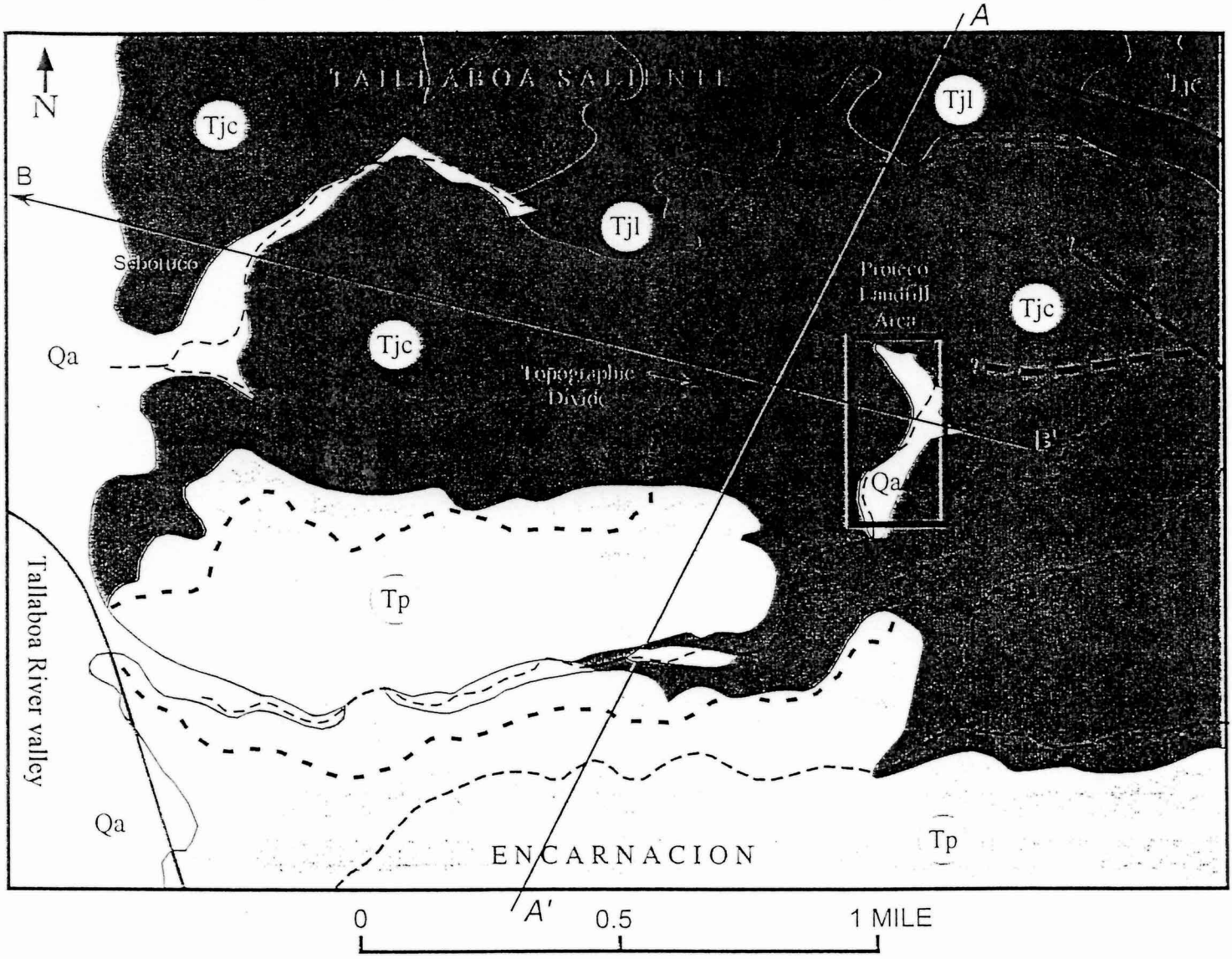

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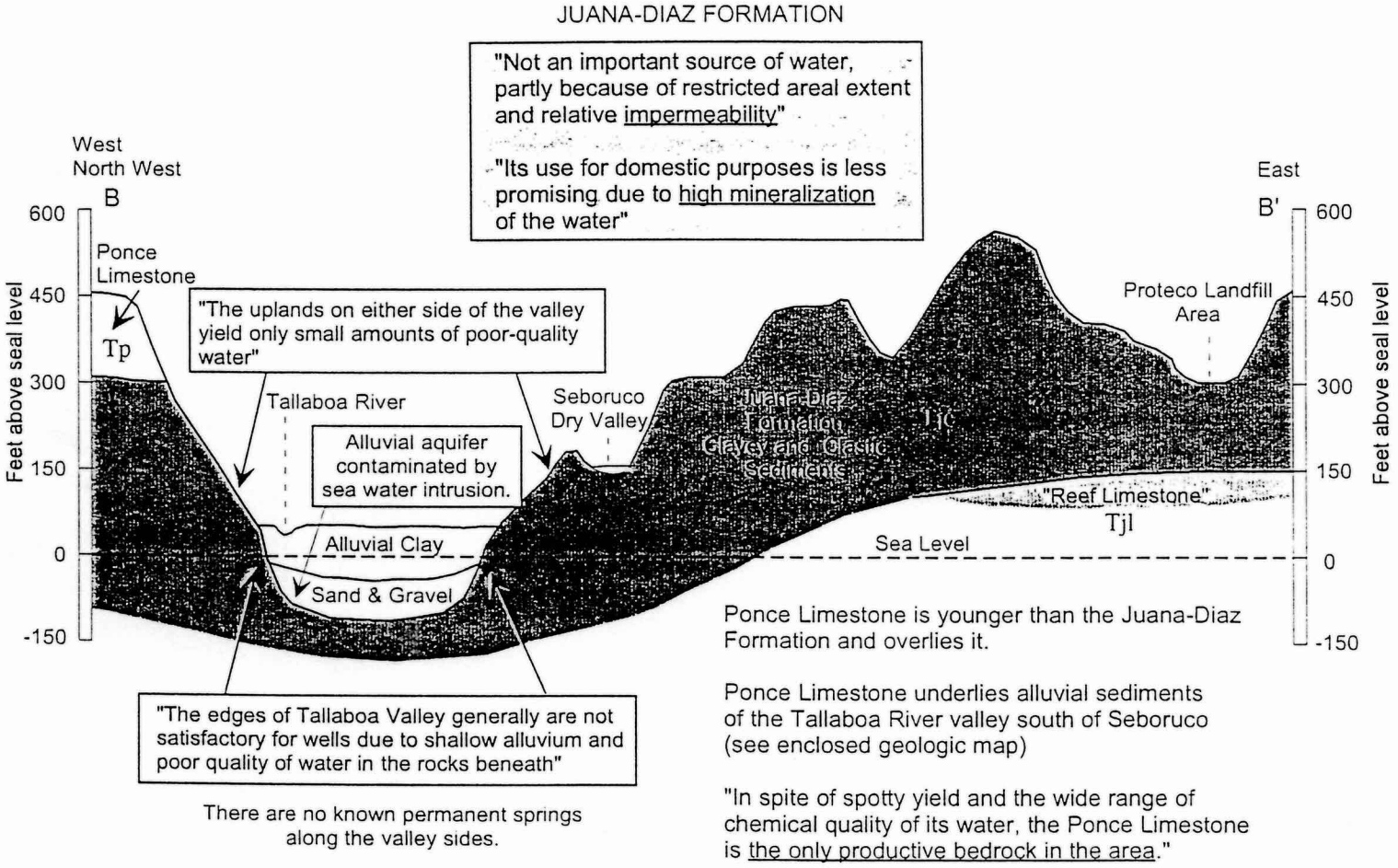

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